Winter Severity Indices for 2004-05

By Amber Roth

Abstract

This report details the Winter Severity Index (WSI) monitoring for northern Wisconsin during the winter 2004-2005. Region-wide, this winter was mild relative to variation in winter severity measurements since 1960. Average WSI was 49 and marks the third mild winter in the most recent four years. Consequently recruitment of fawns and yearlings is expected to be above average in 2005.

Background

Prior to 1975, Wisconsin did not have a formal procedure for measuring winter severity and predicting its impact on deer herds. Michigan was using a severity index that used calorimeters to estimate a winter air-chill factor, and snow depth and sinking-depth measurements to estimate a snow-hazard factor (Verme 1968). The air-chill and snow-hazard factors were added together at the end of each week to derive a cumulative severity index. Ontario was using the Passmore-Hepburn Method, which also entails rather complex snow measurements (Passmore and Hepburn 1955).

Wisconsin's winter severity index (WSI) was developed after testing several procedures for quantifying winter conditions (Kohn 1975). It used the number of days with a minimum temperature of 0°F or below as a measure of winter air-chill, and the number of days with 18 or more inches of snow on the ground to estimate the snow hazard. These are added together from 1 December through 30 April to obtain the WSI. Days with both a minimum temperature of below 0°F, and with 18 inches or more of snow on the ground add 2 points to the WSI. US Department of Commerce (USDC) weather data were initially used to measure winter severity because they were easily obtained, and initially allowed us to compare WSI for previous winters with historical deer data (results of dead deer surveys, Summer Deer Observations, and buck harvests). The WSI was calculated for each of 12 USDC stations and then averaged to obtain the Northern Forest WSI.

Beginning in the winter of 1986-87, weather data were collected at 35 DNR stations across the North (Figure 1*)*. Since 1999-00, four stations were discontinued (Iron River, Cumberland, Medford, and Pound) and one new station was added (New Wood). Daily snow depths and minimum temperatures were recorded at these stations from 1 December through 30 April on a standardized form, and this information was sent to the Northern Wildlife Research Group at the end of each month. Survey instructions request that the presence of crusts be recorded. To date, information on crusts has not been incorporated into the index, but this information may affect our interpretation of the index.

WSI values for the Northern Forest from 1959-60 through 2004-05 are shown in Figure 2. Winters are considered “mild” if the calculated WSI is less than 50, “moderate” if it is between 50 and 80, “severe” if it is between 80 and 100, and “very severe” if the WSI exceeds 100. The 30-year (1975-76 to 2004-05) average is 59. These designations are based on observed associations between WSI and winter mortality, fawn production, and buck harvest during the following year (Wisconsin Department of Natural Resources 2001).

Results

The winter of 2004-2005 was mild relative to the 30-year average. The average across 32 stations with complete reporting was 49 (SD = 21). This is the third year in the recent four years to record mild conditions. The number of points generated by low temperatures was more than double that due to deep snows (Table 1). Roughly 71% of the accumulated WSI points were "low temperature" points and most of these were accumulated during December and January (Figure 3). Low temperatures occurred relatively early with January being the coldest month. Most "snow" points were generated in March.

Among 32 individual stations with complete records, ten reported WSIs reflective of moderate conditions (50<WIS<80), two reported severe conditions (WSI>80), and one was very severe (WSI>100, Table 1).

Discussion

Region-wide the winter of 2004-2005 was not severe enough to cause concern for excessive winter mortality or depressed fawn production during the spring of 2005. While winter severity values were mild or moderate and (in some local instances) severe, deep snows were gone by April – when deer are most vulnerable to winter effects. Consequently, winter survival should have been high and a relatively robust year-class for deer is likely to be born during 2005. However, mild conditions region-wide do not preclude local deer populations from experiencing winter weather effects where winter conditions were relatively severe (e.g. Upson area). The area experiencing severe winter conditions in 2004-05 was relatively small and included a narrow band of stations in Iron, Vilas, and Oneida Counties. Portions of north central Wisconsin and the far northern portion of the Northwest (Douglas and Bayfield Counties) experienced moderate winter severity conditions. Elsewhere, mild conditions prevailed.

Acknowledgments

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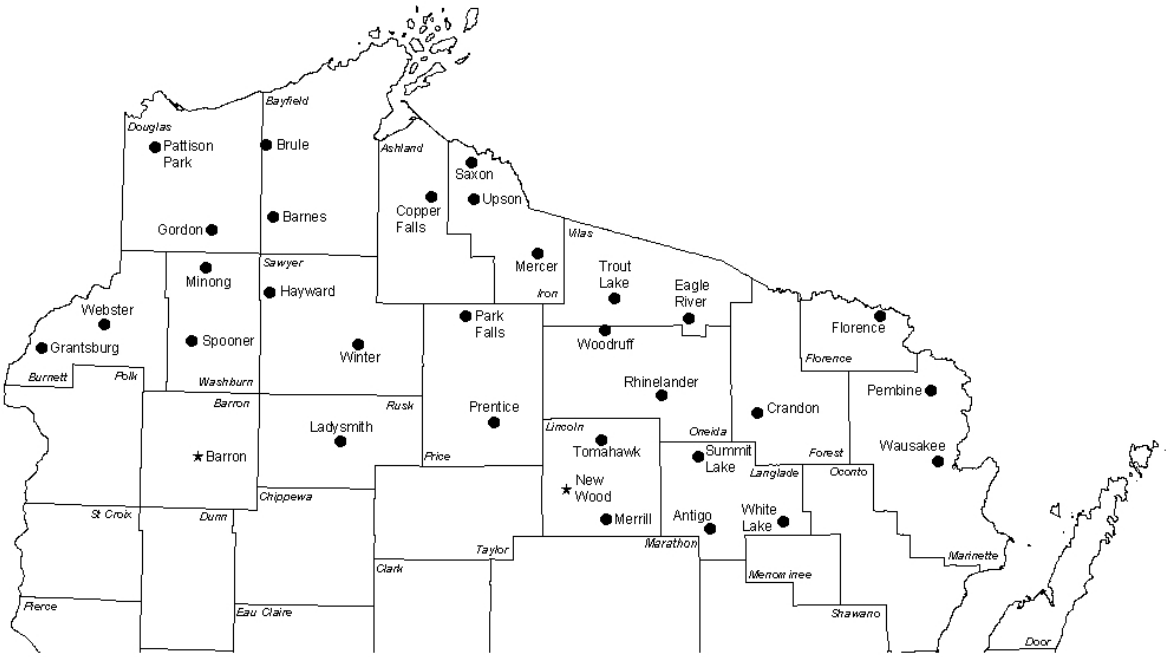

Figure 1. Location of winter severity index recording stations, 2004-05 (★indicate supplemental stations).

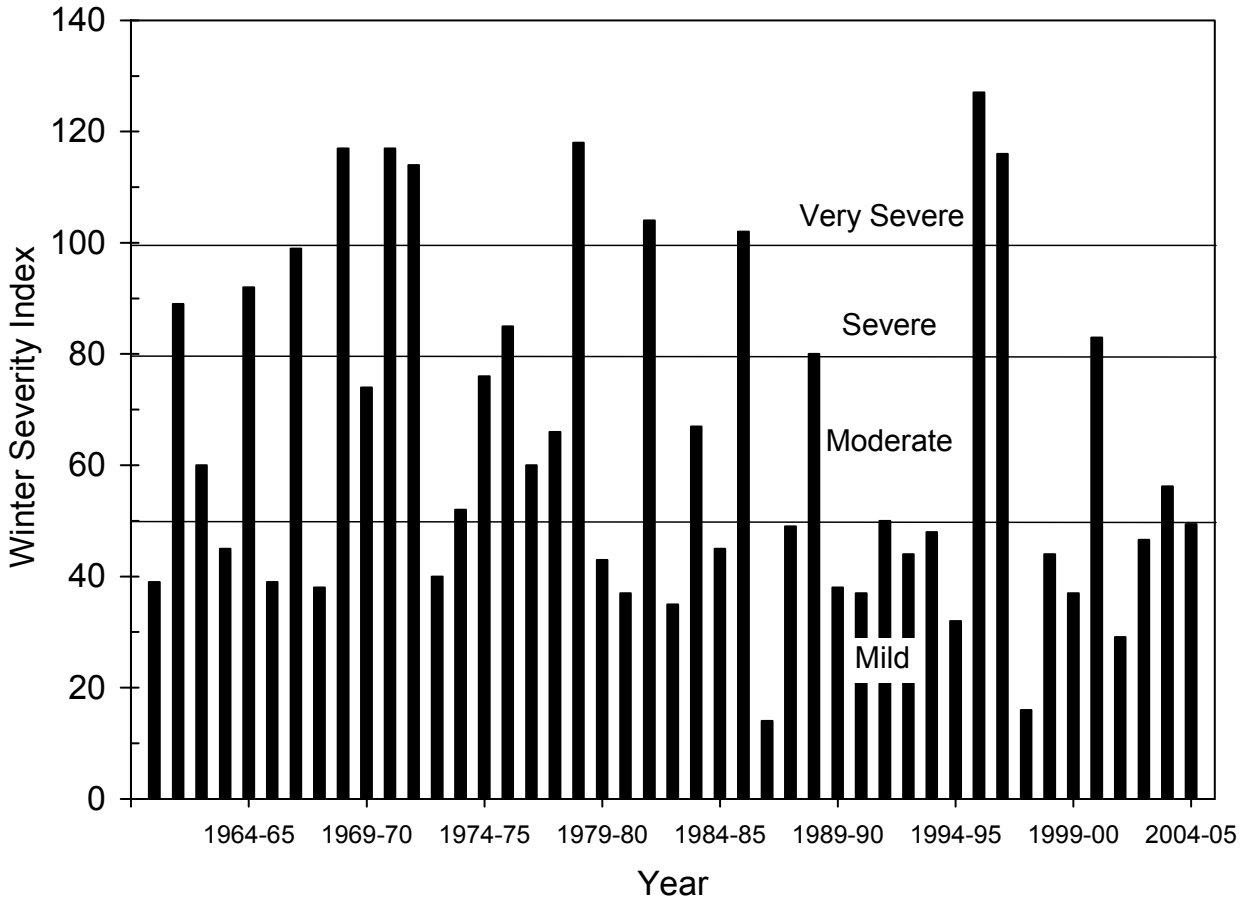

Figure 2. *Winter Severity Indices 1960-1961 to 2004-2005.*

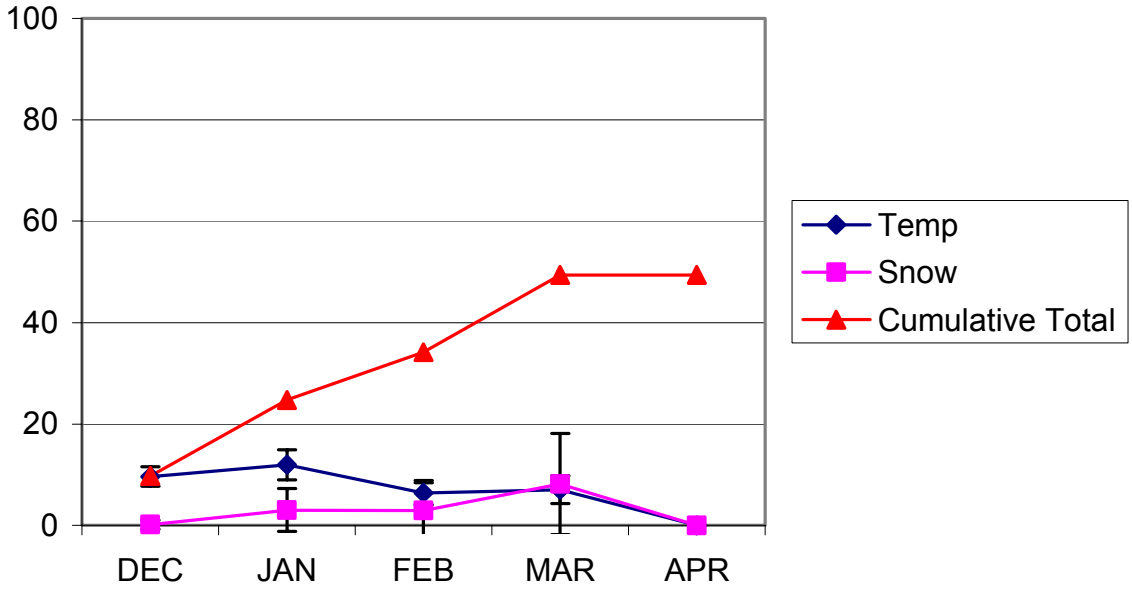

Figure 3. *WSI trend during 2004-2005. Error bars represent ± 1 standard deviation.*

Table 1. *WSI data reported for 2004-2005. TEMP = number of days with temperatures ≤ 0° F, SNOW = number of days with snow depths ≥ 18 inches.*

	DECEMBER		JANUARY		FEBRUARY		MARCH		APRIL		TOTAL		
STATION	TEMP	SNOW	TEMP	SNOW	TEMP	SNOW	TEMP	SNOW	TEMP	SNOW	TEMP	SNOW	TOTAL
Antigo	10	0	10	0	8	0	10	10	0	0	38	10	48
Barron	7	0	11	0	8	0	6	0	0	0	32	0	32
Barnes	11	0	15	3	8	1	9	8	0	0	43	12	55
Brule	11	0	16	8	4	1	7	19	0	0	38	28	66
Copper Falls S.P.	13	0	16	2	7	0	7	4	0	0	43	6	49
Crandon	9	0	13	7	5	9	3	12	0	0	30	28	58
Eagle River	10	0	14	10	8	0	9	23	0	0	41	33	74
Gordon	13	0	18	0	8	0	8	0	0	0	47	0	47
Grantsburg	9	0	13	0	3	0	3	0	0	0	28	0	28
Hayward	10	0	9	0	8	0	9	0	0	0	36	0	36
Florence East	9	0	11	0	7	2	5	8	0	0	32	10	42
Ladysmith	8	0	10	0	2	0	2	0	0	0	22	0	22
Mercer	10	0	13	12	7	12	11	26	0	0	41	50	91
Merrill	8	0	11	0	6	0	4	0	0	0	29	0	29
Minong	10	0	11	0	8	0	8	0	0	0	37	0	37
New Wood	7	0	9	0	9	0	7	5	0	0	32	5	37
Park Falls	12	0	13	0	10	0	9	0	0	0	44	0	44
Pattison	12	0	20	10	2	10	8	9	0	0	42	29	71
Pembine	12	0	14	0	4	0	6	0	0	0	36	0	36
Prentice	9	0	8	1	9	2	10	11	0	0	36	14	50
Rhinelander	10	0	8	6	6	15	7	27	0	0	31	48	79
Saxon	6	0	9	0	3	0	7	0	0	0	25	0	25
Spooner	6	0	8	0	3	0	3	0	0	0	20	0	20
Summit Lake	10	0	10	3	8	0	10	10	0	0	38	13	51
Trout Lake	7	0	12	5	8	8	6	26	0	0	33	39	72
Tomahawk	9	0	14	8	8	0	13	0	0	0	44	8	52
Upson	11	5	12	12	9	21	7	27	0	0	39	65	104
Wausaukee	9	0	12	0	2	0	1	0	0	0	24	0	24
Webster	10	0	13	0	4	0	5	0	0	0	32	0	32
White Lake	7	0	10	0	8	1	10	10	0	0	35	11	46
Winter	13	0	11	0	9	0	7	0	0	0	40	0	40
Woodruff	10	0	8	10	7	13	9	27	0	0	34	50	84
Averages	9.6	0.2	11.9	3.0	6.4	3.0	7.1	8.2	0.0	0.0	35.1	14.3	49.4
SD	2.0	0.9	3.0	4.2	2.4	5.5	2.8	10.0	0.0	0.0	6.7	18.8	21.2